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# How To Fertilize Trees and Shrubs

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# How To Fertilize Trees and Shrubs

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Trees and shrubs require an adequate supply of plant nutrients for proper growth. When these nutrients are not present in the soil in adequate amounts, they must then be supplied by use of fertilizers.[1]

## Determine Fertilizer Needs

The amount and analysis of fertilizer needed depends upon the kind of soil, the nutrients available in the soil, the age and type of plant and the climatic factors in the area where the plants are growing.

Most soils in Hawaii are highly leached leaving them low in plant nutrient supply. They have the capacity to convert large amounts of phosphorus into forms unavailable to plants. These soils are low in cation exchange capacity and retain small amounts of nitrogen and potassium, but these are readily supplied to the plants when present in the soil.

Older plants generally require more fertilizer than younger plants of the same species. Fruiting plants usually require more fertilizer than flowering plants, and flowering plants more than foliage plants.

More fertilizer is required where rainfall is high and where temperatures are continually above 50 F. High rainfall causes high rates of leaching (removal) of plant nutrients beyond the root zone of the plant. Plants continue to grow at temperatures above 50 F. requiring more plant nutrients for proper growth.

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[1]For a detailed discussion of fertilizers, see University of Hawaii Cooperative Extension Service Circular 441, "What's In That Fertilizer Bag?".

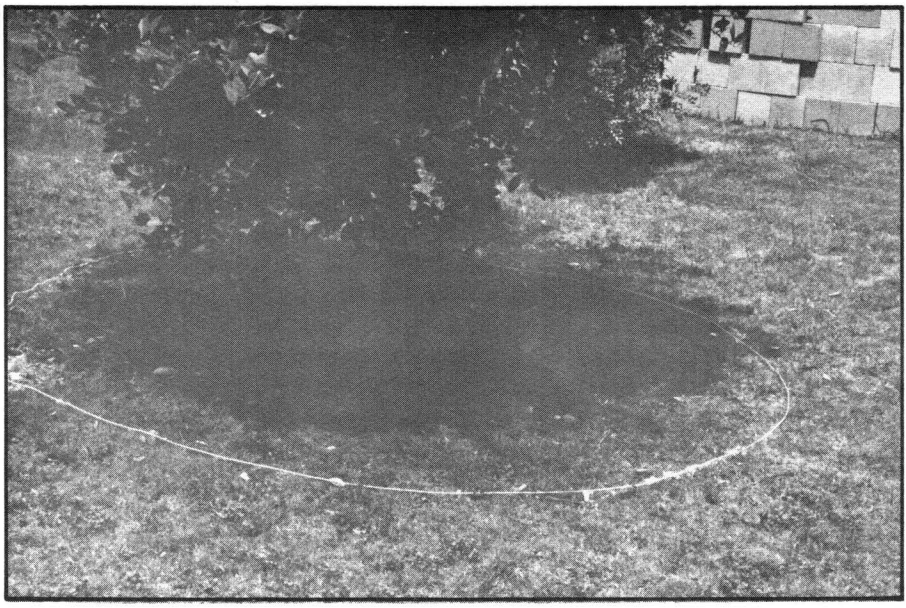

Figure 1. The fertilizer should be applied within the leaf drip area of the tree. Here heavy twine is used to indicate the area wherein the fertilizer should be applied.

Figure 2. Application of the fertilizer in a trench at the edge of the leaf drip area. A modification of this method is to apply the fertilizer in a band on the surface of the soil. Applying in the trench is more effective. Note the twine that marks the boundary of the leaf drip area.

The soil should be tested to determine fertilizer needs. For best results follow the recommendations based upon these soil test.[2]

## Where to Apply Fertilizer

The most effective area of application is within a zone 6 inches from the crown or base of the plant and extending to the leaf drip. The fertilizer may be placed within 2 inches of the crown for smaller plants. This area is the zone where most of the plant roots are found and where the most efficient use of the applied fertilizer will occur.

Phosphorus fertilizers should be applied in the hole and mixed with the soil before planting. This is necessary because the phosphorus is fixed by the soil and moves very little from the area where applied. Failure to apply in the hole before planting results in poor root growth, slow plant growth, unthrifty appearance, and inefficient utilization of applied fertilizers.

## Methods of Application

There are many different methods of application of fertilizer for trees and shrubs.

The best way is to place the fertilizer in a series of randomly spaced holes within the effective area. Some holes should be 6 inches deep, some 12 and some 18. If pavement covers part of the root area, additional holes will be needed in the soil area. Approximately one-eighth to one-fourth pound of fertilizer should be placed in each hole. The hole should then be closed by stepping on it with the heel, or by some similar method of tramping. The hole may be made with a suitable tool such as a soil auger, soil sample probe, a pneumatic drill, etc. When liquid fertilizers are used they may be injected by probes or tree-root feeders.

This method places the fertilizer in the area where the tree roots are found. The roots form throughout the area and increases the effectiveness in plant nutrient uptake, moisture utilization, and anchorage of the plant. This method increases resistance to drought and reduces damage to plant roots. This method requires considerable labor and is considered too slow by some growers, especially where large numbers of plants are to be fertilized, so other methods may be used.

A second method is to spread the fertilizer on the surface of the soil within the effective area. The fertilizer may be spread by hand or machine—machine spreading usually is more uniform than hand spreading. The fertilizer may be worked into the soil or left on the surface. Best results are attained when the fertilizer is worked in, however, care must be taken that roots are not damaged. When the fertilizer is left on the surface, it will be less effective and the results will be slower.

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[2]For information on Soil Testing, refer to Hawaii Cooperative Extension Circulars 428, 432, and 437.

Figure 3. Use of a soil probe to make holes for random placement of fertilizer at different depths. This is the most effective method of fertilization for trees and shrubs.

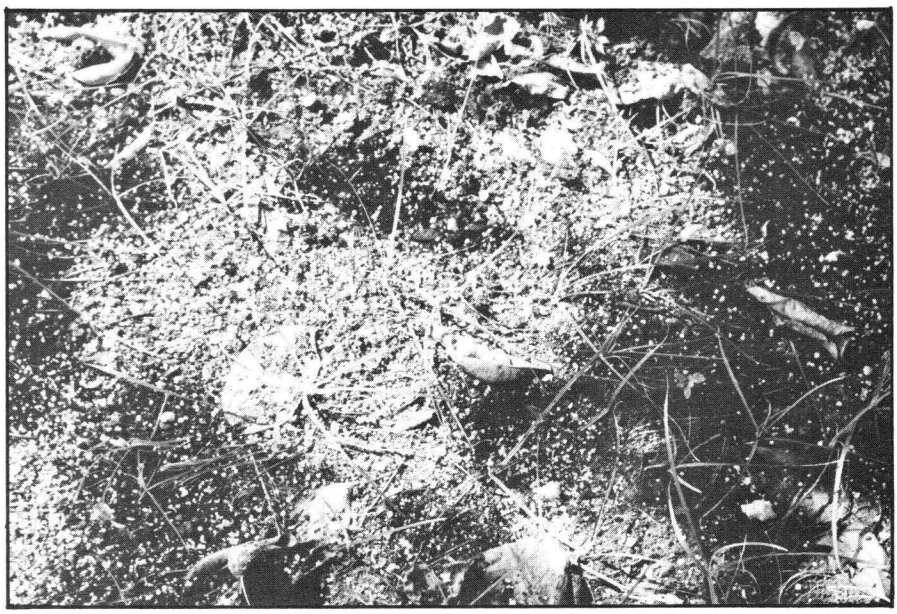

Figure 4. Fertilizer spread broadcast in surface application. This method causes shallow root growth. It is the easiest method of application but the least effective.

The fertilizer may be applied by spreader between rows of plants. This is fast but the fertilizer is diluted over a greater area, reducing its effectiveness. This effect may be reduced by increasing the rate of fertilizer applied.

This method is faster than the first but results in more root damage where the fertilizer is worked in. It also results in plant roots forming at the surface of the soil in order to absorb the nutrients, thereby increasing susceptibility to drought and reducing effectiveness of anchorage of the plant.

A third method is to apply the fertilizer in a trench just within the leaf drip area of the tree. A modification of this method is applying the fertilizer in a band on the surface instead of in a trench. This method is most effective for plants with a fibrous root system, such as coconut and banana. However, this method will severely damage the non fibrous root systems of trees such as citrus, mangoes, etc. No damage will result to non fibrous root systems where applied in a band on the surface but results will be poor because the fertilizer is not placed where most of the roots are found.

A fourth method is the application of fertilizer materials by spraying a dilute solution on the foliage of the plant. Care should be taken to be sure that all foliage surfaces are thoroughly and evenly covered. The solution should be applied until it just begins to drip from the foliage. Applying greater quantities will only waste time and material, as in effect it then becomes a surface application to the soil. The solution should contain a spreader (wetting agent) to insure uniform coverage of the foliage. Care should be taken that solutions are properly formulated so that burning or other damage to the plant does not occur.

All plant nutrients may be absorbed through the foliage of the plant. However, the amounts of nitrogen, phosphorus and potassium required are so great that it is more practical to apply these nutrients directly to the soil. But it is practical to apply the micronutrients (trace elements) in this manner. Many of the carriers of these micronutrients are compatible with insecticides, fungicides, and other spray materials, so that these materials may be combined and applied at the same time - thereby reducing the number of operations required.

Other methods of application may be used for some micronutrients which may be applied by placing some of the carrier beneath the bark. Some may be applied by driving nails or spikes into the tree. Others may be applied by placing scrap metal in the soil around the plant. These methods are somewhat effective, but are not widely used.

### When to Apply Fertilizers

The best time to apply nitrogen, phosphorus, and potassium is just before each new flush of growth. For most plants this is three times a year; in February, June and October. However, the actual flush of new growth depends upon climatic conditions such as temperature and rainfall. For plants such as papaya fertilizer should be applied every 28 to 30 days to provide a continuous adequate supply of

Figure 5. Applying nutrients as a foliar spray. This method is most effective for the micronutrients.

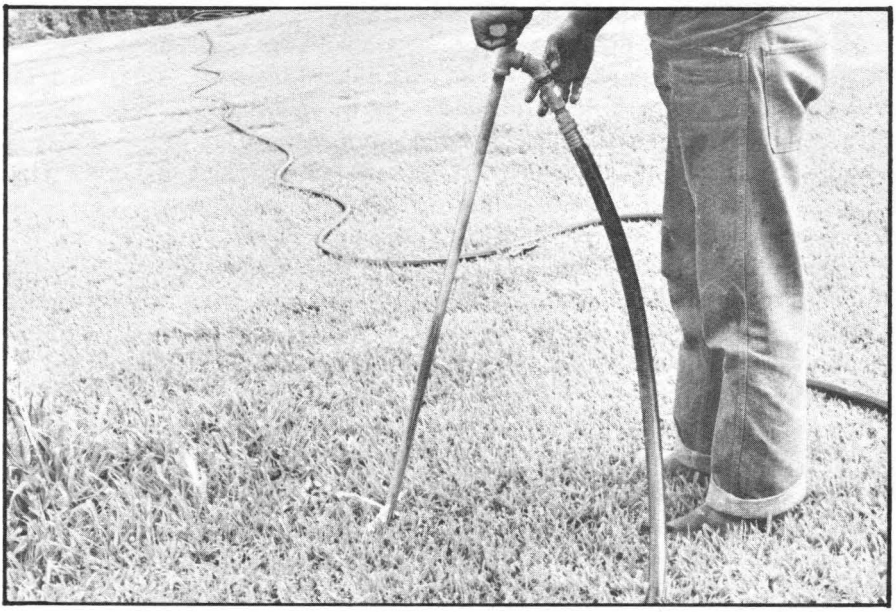

Figure 6. Use of probe for injection of liquid fertilizer into the root zone. This is a modification of random placement of fertilizer at different depths.

plant nutrients. For bananas, fertilizers should be applied every 3 or 4 months to supply adequate nutrients for their growth.

The micronutrients may be included with other nutrients when fertilizers are applied. This generally will prevent the deficiency of these plant nutrients. However, when symptoms of deficiency for any of the micronutrients appear they may be corrected by foliar application. Response is quick and the amount required is small. It is best, however, to prevent deficiency symptoms as yield or quality of plants will be reduced even though the deficiency is easily corrected.

Foliage plants require less fertilizer than fruit trees. An application in the spring and again in the fall is adequate for these plants.

Mature flowering trees that have not been fertilized for many years will produce more leaves and less flowers when first fertilized. For trees of this type apply once a year about one month before flowering. Gradually increase the frequency of fertilizer applications until fertilizer is applied 2 or 3 times each year.

### How Much Fertilizer to Apply

The most accurate method of determining the amount of fertilizer needed is the soil test. However, the following suggestions will provide some ideas on the amount needed.

In general, 1 pound (approximately 1 pint jarfull, or 2 cupfuls) of fertilizer (10-20-20, 10-30-10, etc.) for every inch of trunk or stem diameter at each application is sufficient. This fertilizer should be divided evenly among the holes when applying by the best method. If spreading the fertilizer over the surface 2½ to 3 pounds for each 100 square feet is adequate.

For papayas apply ¼ pound per application (every 30 days) for each plant during the first 3 or 4 months after transplanting, ½ pound during the next 3 or 4 months and then 1 to 1½ pounds as long as the tree remains. For bananas apply 1 to 1½ pounds for the first two applications, 2 to 2½ pounds for the third and then 3 to 4 pounds at each application as long as the matt remains.

For small shrubs or group plantings apply 2 to 2½ pounds for each 100 square feet at each application.

### Form of Fertilizer to Use

The fertilizer may be applied as dry or liquid, blended or pelleted, or as slow or normal release materials. The form to apply depends upon your own individual preference, the equipment available, the form available in your area, and the relative cost of the different materials.

The slow release materials are expensive but require less frequent application. They are most useful on plants grown for their foliage but can be used for other plants. However, their slow release characteristic usually does not provide the large amount of available nutrients needed at the time of flowering or fruiting by some plants.

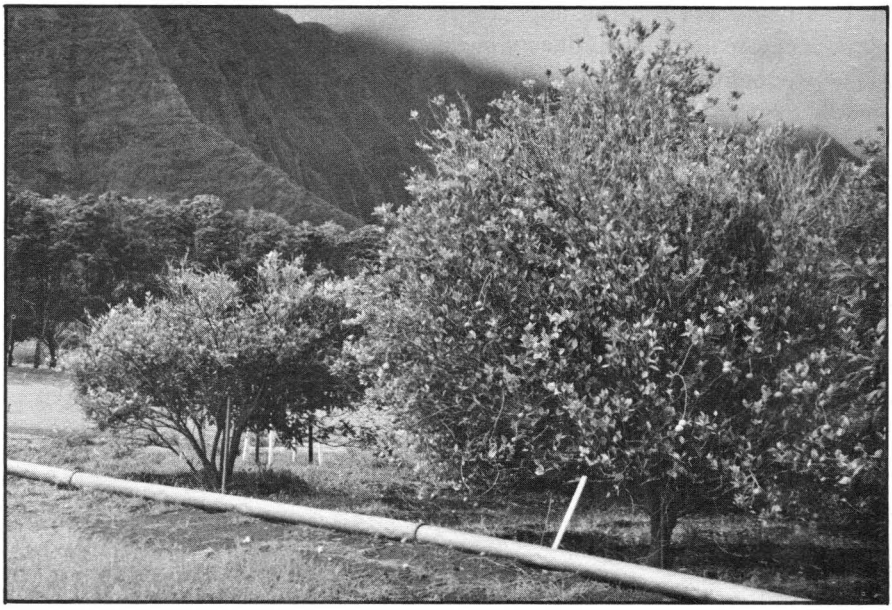

**Figure 7. The effect of fertilization on growth of citrus trees. Note differences in size of trees of the same age.**

Most people consider liquid fertilizers more convenient to apply, if the proper equipment is available. The liquids generally are more expensive than the dry forms as they are of lower analysis. Liquid and dry fertilizer are of equal effectiveness when the same amount of plant food is applied by the same method to the plant.

Blended and pelleted fertilizers are essentially the same. Pelleted fertilizers may have an advantage where small amounts of fertilizer are required as each granule is of the same analysis whereas each granule of the blended fertilizer is different.

The most effective use of fertilizers is obtained when the proper amounts and ratios are applied by the most effective method to meet the needs of the individual plant.

For more detailed information and assistance, contact your County Agricultural Agent at the nearest County Extension Office listed below.

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| Kau Office | State Office Building,<br>Naalehu | P. O. Box 96<br>Naalehu, Hawaii 96722 |
| Kona Office | Kainaliu | P. O. Box 208<br>Kealakekua, Hawaii 96750 |
| **MAUI-MOLOKAI COUNTY** | **Location** | **Mailing Address** |
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| Kula Office | Kealahou Community Hall,<br>Waiakoa | P. O. Box 26<br>Kula, Hawaii 96790 |
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| *Plant Disease Clinic* | St. John Building | 3190 Maile Way<br>Honolulu, Hawaii 96822 |

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